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Diffusion and Classical Dynamics

Abstract

We consider the behavior of a massive particle put into an ideal gas environment, assuming that the massive particle and the light gas particles evolve according to non-random classical dynamics. The interactions between massive particle and light gas particles are assumed to be given by a potential function with compact support. Our purpose is to prove that under certain condition, when the mass of light gas particles converges to 0, the behavior of the massive particle converges to a diffusion. For the case where the initial velocities of all light particles are fast enough, one can prove that light particles pass through their valid ranges of interactions within time periods that are short enough, so by using freezing-approximation, one can get the expected convergence to diffusion. In this talk, we consider the case where there also exist light particles with initial velocities not so fast, and prove that under certain condition, the behavior of the massive particle converges to a diffusion, too.